इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 15680 (2006): Guidelines for selection of steam traps
[MED 1: Boilers and Pressure Vessels]

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

भारतीय मानक

स्टीम ट्रैप के चयन की मार्गदर्शिका

Indian Standard

GUIDELINES FOR SELECTION OF STEAM TRAPS

ICS 27.040

© BIS 2006

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

July 2006

Price Group 3

Boilers and Pressure Vessels Sectional Committee, ME 01

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Boilers and Pressure Vessels Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard is based on the experience of the manufacturer and the user organization, prevalent design and operation of steam traps.

The composition of the Committee responsible for the formulation of this standard is given at Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be same as that of the specified value in this standard.

Indian Standard

GUIDLINES FOR SELECTION OF STEAM TRAPS

1 SCOPE

This standard covers principle of operation and guidelines for selection and operation of various types of steam traps.

2 VARIOUS TYPES OF STEAM TRAPS

2.1 Density Operated Traps

2.1.1 *Ball Float with Thermostatic Air Vents*

2.1.1.1 *Operation*

Air entering the trap is immediately discharged through a high capacity auxiliary air vent. Condensate causes the ball float to rise and place the modulating discharge valve in a position that will pass the condensate continuously as it enters the trap. The condensate level in the trap body is maintained above the discharge valve to provide a positive seal against the loss of steam.

2.1.1.2 *Special features*

a) Discharge condensate continuously as rapidly as it forms;
b) High air venting capacity through auxiliary balanced pressure air vent, which is self-adjusting for varying steam pressures;
c) High thermal efficiency at both light and heavy loads;
d) Continuous modulating discharge does not create pressure disturbances, which may cause erratic control in air heating coils, shell and tube exchangers, etc;
e) Steam lock release (S.L.R.) facility available;
f) In line inlet and outlet facility, easy installation at low cost;
g) Robust, fair resistance to water hammer;
h) Fails in closed position, so no wastage of steam energy;
j) Unaffected by changes in inlet pressure;
k) Suitable for high condensate loads;
m) Available with screwed/socket welded/flanged end connection; and
n) Available with in-built/separate strainers.

2.1.1.3 *Typical applications*

Air unit heaters, hot water heaters, heat exchangers, converters, dryers, re-boilers, jacketed pans and all process equipment.

2.1.1.4 *Limitations*

a) Cannot be used where trap is fitted with air vent and degree of superheat is more than 100°C, and
b) Water hammer can damage float.

2.1.2 *Inverted Bucket Traps*

2.1.2.1 *Operation*

The trap body is normally filled with condensate to maintain a seal around the inverted bucket, which serves as a float to operate the discharge valve. Live steam entering the bucket floats it to close the valve. During the closed period, condensate collects in the piping at the inlet side of the valve until steam floating the bucket leaks through a small hole in the top of the bucket and permits the bucket to drop and open the valve. The condensate is discharged, followed by steam, which is required to actuate the float mechanism. Air can pass through the small hole at the top of the bucket.

2.1.2.2 *Special features*

a) Good resistance to water hammer,
b) Simple and robust mechanism and easy to maintain,
c) Intermittent discharge,
d) Discharge condensate and air at steam temperature,
e) Operate on superheated steam,
f) Operate against any back pressure,
g) Available with in-built/separate strainers, and
h) Available with screwed/socket welded/flanged end connection.

2.1.2.3 *Typical applications*

High pressure indoor steam main drips and submerged heating coils, kettles.

2.1.2.4 *Limitations*

a) Low thermal efficiency under varying loads and pressures and some steam loss for operation,
b) Must maintain water seal to avoid continuous discharge of steam,
c) Must be protected from freezing,

d) Discharge condensate continuously as rapidly as it forms, and

e) Bleed hole in bucket has very limited air-venting capacity.

2.2 Temperature Operated Traps

2.2.1 *Balanced Pressure Thermostatic Traps*

2.2.1.1 *Operation*

The trap is operated by a flexible thermostatic element filled with a fluid, which when heated or cooled evaporates or condenses. Internal pressure changes expand or contract the element and position the attached valve head. On start-up the cold elements is contracted, and the wide open valve remains open to discharge air and sub-cools condensate. When steam reaches the trap, the element expands and closes the trap. When condensate surrounding the capsule cools to approximately 10°C to 20°C below steam temperature (depending on the filling) the trap opens to discharge condensate.

2.2.1.2 *Special features*

a) High air venting capacity for fast start-up,

b) Large capacity in small size,

c) Self adjusting – will operate without adjustments at all pressures within its range,

d) Will not freeze if given free discharge,

e) Use same valve sizes for all pressures within its operating range,

f) Minimum parts,

g) Operates in vacuum systems,

h) Modulating discharge,

j) Operate on moderate superheated steam,

k) Discharges condensate close to steam temperature (5-10°C sub-cooling),

m) Reacts to temperature changes immediately,

n) Ensure prevention of live steam loss,

p) Available with in-built strainers, and

q) Available with screwed/SW/flanged end connections.

2.2.1.3 *Typical applications*

Steam radiators, low and medium pressure submerged heating coil, sterilizers, steam tracer, steam mains, presses and dryers.

2.2.1.4 *Limitations*

a) Not suitable for highly superheated steam,

b) Limited resistance to water hammer and corrosion, and

c) Not suitable for applications in which condensate must be discharged as fast as it is formed.

2.2.2 *Bi-metallic Thermostatic Trap*

2.2.2.1 *Operation*

The operating principle is based on a balance between the steam force (pressure dependent), trying to open the discharge valve, and the opposing bi-metal force (temperature dependent) which tends to close it. The trap is adjusted so that all saturated steam temperature the bi-metallic force will prevail, while with under-cooled condensate and air, the force of pressure will prevail and open the valve trap, the required under-cooling should be minimum possible through out the designed pressure range. Being the steam force a curve while the bi-metallic force a straight line, an additional compensating spring will break the straight line to make it follow the curve of steam more closely making field adjustment unnecessary.

2.2.2.2 *Special features*

a) Modulating discharge,

b) Condensate is discharged below steam temperature (20°C/30°C). Sub-cooling temperature can be adjusted on field,

c) A compensating spring between the bi-metallic element and the valve steam ensures that the trap operation follows the steam curve closely. The spring does not induce valve spring,

d) May be used on superheated steam,

e) Valve steam acts as a checked valve,

f) Resist water hammer and vibration,

g) Replaceable internal parts,

h) Efficient discharge of air and non-condensable gases, and

j) Freeze proof full size 'Y' pattern integral strainer.

2.2.2.3 *Typical applications*

Tracing lines, tank heaters, marine applications.

2.3 Kinetic Energy Operated Traps

2.3.1 *Thermodynamic Disc Traps*

2.3.1.1 *Operations*

Condensate and air raise the disc and flow freely through the trap. When steam reaches the trap, the velocity under the disc is instantly increased and recompression above the disc snaps it on to its seats to give a tight shut off. Heat loss from the small control chamber, which is filled with a steam, condensate mixture, causes the chamber pressure to decrease to a point at which the valve disc opens again to discharge condensate.

2.3.1.2 *Special features*

a) Compact and light weight;

b) High resistance to water hammer;

c) Long life due to hardened seat and disc;

d) Only one moving part;

e) Efficient operation under varying loads and pressures;

f) Fast response to changing loads;

g) Discharges condensate at steam temperature, to prevent water logging;

h) Discharges air and non-condensable gases;

j) Freeze proof;

k) Operates on superheated steam;

m) Available with in-built strainers; and

n) Available with screwed/SW/BW/flanged end connection.

2.3.1.3 *Typical application*

Steam main drips, high pressure and superheat, steam tracer lines, unit heaters.

2.3.1.4 *Limitations*

a) Not suitable for pressures below 0.25 bar, and

b) Some models limited 50 percent back pressures, others suitable for 80 percent of back pressures.

3 TYPICAL CHART FOR STEAM TRAP SELECTION AND APPLICATIONS

D = thermodynamic disc traps,

T = balanced pressure thermostatic traps,

B = bi-metallic thermostatic traps,

I = inverted bucket traps, and

G = ball float with thermostatic air vent traps.

Applications Trap		Choice
Steam Mains		D – T
Tracing Lines		D – B
Tanks	Storage tanks Oil tanks Asphalt tanks Dye vats Evaporators	B – T
Heater Batteries	Blenders Suction heaters Unit heaters Drying rooms Greenhouse coils Fin coils	G – I
Pans	Sugar dryers Jacketed pans Tilting kettles Brew kettles Candy kettles Cheese kettles	G – I
Heat Exchangers	Submerged coils Water heaters Fuel oil pre-heaters Plating tanks	G – I
Drying Cylinders	Paper dryers Pulp dryers Rotary dryers Calendars	G – I
Presses	Plywood presses Moulding presses Tire mould presses Vulcanizing presses Milk dryers	D – T
Ovens	Dressing sterilizers Pressure cookers Autoclaves Drum dryers	G – T
Ironing Machines		I – D
Turbines		D – I
Marine Applications		D – B

ANNEX A
(*Foreword*)

COMMITTEE COMPOSITION

Boilers and Pressure Vessels Sectional Committee, ME 01

Organization	*Representative(s)*
Central Boilers Board, New Delhi	Shri V. K. Goel (***Chairman***) Shri M. L. Ahuja (*Alternate*)
Alstom Power Boilers Ltd, Durgapur/Delhi	Shri Ramesh T. Yavagal Shri P. K. Pal (*Alternate*)
Bharat Heavy Electricals Ltd, Tiruchirapalli	Shri G. Uma Shanker Shri K. Padmanaban (*Alternate*)
Bharat Heavy Plate & Vessels Ltd, Visakhapatnam	Shri M. S. V. S. N. Murthy Shri C. H. Ramanaiah (*Alternate*)
Bureau Veritas, Mumbai	Shri A. U. M. Rao Shri V. Kumar (*Alternate*)
Central Electricity Authority, New Delhi	Shri A. K. Gupta Shri D. K. Gilhotra (*Alternate*)
Central Mechanical Engineering Research Institute (CSIR), Durgapur	Shri P. R. Samaddar Shri P. K. Sen (*Alternate*)
Chief Inspector of Boilers, Chennai	Shri T. K. Thambithurai Shri Thiru K. Regunath (*Alternate*)
Department of Atomic Energy, Mumbai	Shri H. S. Kushwaha Shri K. K. Vaze (*Alternate*)
Development Consultants Pvt Ltd, Kolkata	Shri Dipak K. Sarkar Shri Asim Kumar De (*Alternate*)
Directorate General of Factory Advisory Services & Labour Institute, Mumbai	Shri M. S. Tyagi Shri P. K. Saxena (*Alternate*)
Engineers India Limited, New Delhi	Shri V. J. Nalgirkar Shri A. K. Malik (*Alternate*)
Indian Boilers Manufacturers' Association, Mumbai	Shri N. B. Tapaswi
Indian Oil Corporation Ltd, Vadodara	Shri U. S. Prasad Shri R. K. Sabharwal (*Alternate*)
Indian Register of Shipping, Mumbai	Shri A. K. Sharma Shri I. Majumdar (*Alternate*)
Industrial Boilers Ltd, Mumbai	Shri R. N. Engineer
Larsen & Toubro Ltd, Mumbai	Shri G. K. Sadekar Shri S. S. Iyer (*Alternate*)
Lloyd's Register Asia, Mumbai	Shri B. Saraswat Shri P. K. Banerjee (*Alternate*)
Mecon Limited, Ranchi	Shri Om Prakash Shri B. K. Verma (*Alternate*)
National Thermal Power Corporation Ltd, Noida	Shri D. K. Jain Shri P. K. Dev (*Alternate*)
Oil Industries Safety Directorate, New Delhi	Shri S. C. Gupta Shri Shamsher Singh (*Alternate*)

Organization	*Representative(s)*
Petroleum and Explosive Safety Organization, Nagpur	Shri M. Anbunathan Shri A. N. Biswas (*Alternate*)
Projects & Development India Ltd, Noida	Shri A. K. Gupta Shri R. P. Sinha (*Alternate*)
Tata Iron and Steel Company Ltd, Jamshedpur	Dr M. D. Maheshwari Shri C. B. Lunawat (*Alternate*)
The Anup Engineering Ltd, Ahmedabad	Shri G. N. V. Mohan Raju Shri R. D. Ciristy (*Alternate*)
The Indian Sugar and General Engg Corporation, Yamuna Nagar	Shri Sunil Uppal Shri Dharmender Sharma (*Alternate*)
Thermax Babxoxk & Wilcox Limited, Pune	Shri S. A. Vanchinath Shri Tamal Dutta (*Alternate*)
Welding Research Institute, Tiruchirapalli	Shri G. Uma Shanker
In personal capacity *(Qualiquest Industrial Services, 26 Manak Vihar, New Delhi)*	Shri M. G. K. Rao
BIS Directorate General	Shri C. K. Veda, Scientist 'F' & Head (MED) [Reprsenting Director General (*Ex-officio*)]

Member Secretary
Shri C. K. Veda
Scientist 'F' & Head (MED), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. ME 01 (0232).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002
Telephones : 2323 01 31, 2323 33 75, 2323 94 02

Telegrams : Manaksanstha
(Common to all offices)

Regional Offices :		Telephone
Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110 002	2323 76 17 2323 38 41
Eastern	: 1/14 C.I.T. Scheme VII M, V. I. P. Road, Kankurgachi KOLKATA 700 054	2337 84 99, 2337 85 61 2337 86 26, 2337 91 20
Northern	: SCO 335-336, Sector 34-A, CHANDIGARH 160 022	260 38 43 260 92 85
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600 113	2254 12 16, 2254 14 42 2254 25 19, 2254 23 15
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400 093	2832 92 95, 2832 78 58 2832 78 91, 2832 78 92

Branches : AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. NALAGARH. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM. VISAKHAPATNAM.

Printed at Prabhat Offset Press, New Delhi-2